

Development and Maturation page

Each technology being developed by the LOCAD team and its collaborators has relied on cutting-edge biochemical techniques. The hardware used to collect samples and analyze data has undergone testing in the laboratory in preparation for field tests or on-orbit operations. Members of the LOCAD team have extensive experience in technology design and development, flight hardware verification, molecular biology techniques, optics, microfluidic chip fabrication, and extreme environment testing. Each of these areas of expertise is utilized in the LOCAD technology maturation process.

Development and Maturation:

● **LOCAD-Portable Test System (PTS):**

- Flight modified commercial unit marketed by Charles River Laboratories
- Color-change test using enzymes extracted from horseshoe crab blood
- Swabbing tool was designed and fabricated at Marshall to collect samples from surfaces

Near-term future developments:

- Completely new sample preparation tool for concentrating cells in liquid samples
- A cartridge that can distinguish between live and dead bacterial cells
- A cartridge to monitor water turbidity on the International Space Station

● **Extended PTS:**

- Modified PTS unit designed to house and analyze a protein microarray
- Protein microarrays provide enhanced specificity for certain compounds over the color-change test used in the PTS

Near-term future developments:

- New sample preparation procedures generated
- PTS unit outfitted with different pumps, onboard optics, and analysis software
- New cartridges designed to house printed microarrays

● **Integrated Microfluidic-Microarray Monitor (IM3):**

- Merging of microfluidic technology with the microarray technology found on the Extended PTS
- Microfluidics offers increased speed, precision, and control on fluids while decreasing sample volume

Near-term future developments:

- Laboratory tests of each process to be performed on the microfluidic chip
- Transition from breadboard to prototype unit
- Test individual sample preparation processes using the prototype unit and microfluidic chips; followed by testing sequential processes